



U.S. Department  
of Transportation

Intelligent Transportation Systems  
Professional Capacity Building Program:

***Planning and Deploying ITS:  
Six White Papers  
Describing Current and Planned Programs of  
Five Transportation Associations  
And  
Four University ITS Research Centers of Excellence***

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U.S. Department of Transportation  
ITS Joint Program Office  
ITS Professional Capacity Building Program  
Washington, DC

## **FORWARD**

In the fall of 1997, the ITS Professional Capacity Building Program initiated the development of six “White Papers” to briefly describe the current status of, and plans for future education and training activities of six organizations engaged in various aspects of the planning and deployment of Intelligent Transportation Systems (ITS). Those organizations are:

- The Intelligent Transportation Society of America (ITSA)
- The American Association of State Highway and Transportation Officials (AASHTO)
- The American Public Transit Association (APTA)
- The National Transit Institute (NTI at Rutgers University)
- The Institute of Transportation Engineers (ITE)
- University ITS Research Centers of Excellence (the University of Michigan, The Texas Transportation Institute at Texas A&M University and Virginia Polytechnic institute) and the ITS Institute at the University of Minnesota.

This document presents a synthesis of those six papers, as well as complete copies of each. We are grateful for the participation by each organization and the contribution of the authors of each paper.

To fully appreciate the value of this information, the reader must understand the context within which this effort was undertaken. Stated simply, we must understand the basic demand, or the need, for education and training for ITS deployment; now and into the foreseeable future.

The ITS Professional Capacity Building program was formally launched by the US Department of Transportation (USDOT) in March, 1996. It's clear purpose is to ensure that professionals and technicians engaged in all aspects of the ITS programs have the requisite knowledge, skills and abilities (KSA's) to meet the challenges of deploying ITS as part of the 21st century transportation system. In addition, it is imperative that we expand the pool of professionals and technicians required to do so.

During FY 1996 and FY 1997, USDOT prepared and delivered a comprehensive package of seminars, workshops, and short courses. This was accomplished with the assistance of many dedicated professionals within the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA), together with assistance from Professional Associations and contractors hired to support these efforts. Those activities were targeted to meet the highest priority, immediate and well known training needs of existing professionals. Since March 1996, we have delivered over 100 training events to about 2500 people throughout the country. The program continues at a rapid pace. However, we must now project beyond the present and determine future training and education needs for ITS transportation programs in order to also expand the pool of professionals and technicians required to effectively move into the 21st century.

Consequently, in mid 1997, the first steps were taken to begin a systematic and comprehensive assessment of future KSA requirements. Those efforts included the following:

1. The preparation of six *White Papers* (this document) that address current training and perceived future needs of Professional Associations and Universities.
2. A report documenting the state-of-the-knowledge about ITS training and education needs entitled, *ITS Training & Education Needs Assessment Baseline: A Review and Synthesis of Thirteen Prior Studies, Field Interviews, and A Summary Assessment of ITS Needs*. This report combines information into the following three sections:
  - a. Section I is a review and synthesis of 13 studies conducted on this topic since 1992.
  - b. Section II is a companion effort encompassing a series of ten field interviews with state, regional, local, highway and transit professionals engaged in ITS planning and deployment.
  - c. Section III is a summary assessment of the first two reports that structures the information so as to be useful for planning new courses.

This report was prepared by USDOT's Volpe National Transportation Systems Center, under the direction of the ITS Professional Capacity Building Program. (The report has been widely distributed and is available upon request.)

Taken together, the six white papers plus the Volpe needs assessment baseline provide an excellent baseline from which we can proceed in a systematic process to develop a "curriculum" of education and training programs that relate specific KSA's to specific functions in the public sector and in the private sector. Consequently, the following activities are now underway:

- I. Establish the framework for professional and technical education and training needs. This will be based upon the knowledge areas required for each of the various ITS deployment stages and the four program areas of ITS deployment (Metropolitan, Rural, Commercial Vehicle Operations, and the Intelligent Vehicle Initiative).
- II. Establish core competencies for each function within the deployment stages, and for the program areas.
- III. Identify the knowledge, skills and abilities required to establish those core competencies.
- IV. Establish the curricula and a series of courses to meet those needs, incorporating:
  - A. Training and re-training existing professionals, targeted for:
    - Agency and company courses, delivered internally and externally
    - Community Colleges/Junior Colleges
    - Continuing education programs
    - Technical schools
    - Universities
  - B. Training the professionals of the future, at the:
    - Undergraduate level

- Graduate level
- C. Continuous education programs targeted for:
- Agency and company level programs
  - Academic programs
- D. Public Officials, General Public, K- 12
- V. Develop specific, individual training and education programs to be used within the curricula described above.
- VI. Identify appropriate delivery media for the curriculum/course presentations (i.e., traditional classroom, distance learning, interactive CD-ROM, etc.)

We expect that by the latter part of FY 1998, we will have accomplished much of the above. That work will then help us shape a long term and continuing education and training curriculum for the foreseeable future.

We end this Forward with grateful acknowledgment of the significant contributions made by many dedicated individuals throughout the country. Obviously, it would be impossible to name all of those individuals here. But, the reader of this document should understand that an extensive effort has already gone into the program, and that a continuous effort will be required to meet the ITS Professional Capacity Building program objectives.

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## **SYNTHESIS OF SIX WHITE PAPERS:**

### **INTELLIGENT TRANSPORTATION SYSTEMS (ITS) TRAINING AND EDUCATIONAL ACTIVITIES WITHIN TRANSPORTATION ORGANIZATIONS**

The purpose of this synthesis is to briefly summarize current and planned ITS education and training activities within the following organizations:

- Intelligent Transportation Society of America (ITSA)
- American Association of State and Highway Transportation Officials (AASHTO)
- American Public Transit Association (APTA)
- National Transit Institute (NTI at Rutgers University)
- Institute of Transportation Engineers (ITE)
- ITS University Research Centers of Excellence (RCE) and the ITS Institute

**The complete papers follow this synthesis.**

The objective of each of the six White Papers is to provide a summary of current and anticipated activities each organization is pursuing in the area of ITS Professional Capacity Building. The white papers were developed to address the following questions:

- What is the organization doing now with respect to ITS education and training?
- How did the organization determine the current need for ITS education and training?
- What ITS education and training does the organization plan for the future?
- How does the organization determine future ITS education and training needs?

#### **Intelligent Transportation Society of America (ITSA)**

Given its mission and purpose, all of ITSA's activities are directly related to ITS. ITSA's education and training programs currently underway and/or planned include:

1. Professional Capacity Building (PCB) National Steering Committee.  
ITS America formed the PCB Steering Committee as an Advisory Committee to USDOT on matters related to the PCB program.
2. Education and Training (E&T) Committee.  
This committee was recently elevated to a Full Standing Committee.
3. Short courses and seminars to state chapters.
4. ITSA Student Chapter presentations.

ITSA's demand for the PCB Program was initiated as a result of stakeholders' concerns regarding training and education needs. ITSA plans to continue their education and training programs, in conjunction with USDOT and related professional associations.

Future ITSA initiatives will include:

- Certification and credentialing

- Sustaining ITS education and training among practitioners
- Integrating ITS into universities and college curricula

### **American Association of State and Highway Transportation Officials (AASHTO)**

AASHTO's involvement in ITS education and training include:

1. Highway Sub-committee on Advanced Transportation Systems
2. Task Force on Partnerships for Traffic Management Software Development
3. ITS Standards Development Oversight Committee
4. AASHTO membership on PCB National Steering Committee
5. ITS Resources Guide
6. Scanning Tours
7. Interdisciplinary Awareness Activities

The activities in the area of ITS evolved as a response to issues and problems rather than a result of a formal process. There is no formal structure established for professional capacity building for ITS, except as noted above.

AASHTO future activities in ITS PCB involve a continuation of the basic approach that has been set in the following areas:

1. PCB National Steering Committee
2. Advanced Transportation Systems Subcommittee
3. Task Force on Partnerships for Traffic Management Software Development
4. Scanning Tours

### **ITS Professional Capacity Building at The American Public Transit Association (APTA)**

Current programs with an ITS training and education component include:

1. National Conferences
2. Publications
3. ITS Advocacy
4. Transit Cooperative Research Program
5. Transit Research Innovation Program
6. Collection and distribution of ITS information to the transit community
7. Member of the PCB National Steering Committee

Demand for APTA's programs was determined through responses from questionnaires and surveys following each APTA ITS event.

APTA plans to continue current activities and expand them through new initiatives in conjunction with FTA and NTI. APTA also plans to refine and expand the ITS information dissemination process over the coming years.

## **ITS Professional Capacity Building at The National Transit Institute (NTI)**

NTS serves the Transit Industry, and it offers courses in three ITS program areas:

- I. Advanced Technologies and Innovative Practice
2. Multi modal Transportation Planning
3. Management and Supervisory Courses

The current courses include the following:

Advanced Technologies and Innovative Practices Program Area — Two existing courses in this program area specifically address ITS issues:

- GIS: Transit Applications - (3 Days)
- Procuring New Technologies for Transit (2 Days)

Multi-Modal Transportation Planning Program Area — The six courses in this program area that contain some ITS components are:

- Public Involvement in transportation decision making (2 1/2 days)
- Financial Planning and Programming for Metropolitan Planning Organizations (3 Days)
- Introduction to Metropolitan Transportation Planning (2 Days)
- Major Investment Studies (3 Days)
- Statewide and Metropolitan Transportation Program Development (2 1/2 Days)
- Market Segmentation for Transit - This course is currently under development and is being designed to aid transit agencies in identifying customer needs and available technologies and services to meet them. It is scheduled for delivery Fall 1998.

Management and Supervisory Program Area — NTI also offers an integrated series of management and supervisory training programs.

NTI programs were initially developed based on input from a representative group of industry representatives through an Advisory Committee. NTI created the Advanced Technologies and Innovative Practices program area with the express intent of developing and delivering ITS training and education courses directly to transportation organizations. This was done through a curriculum committee.

NTI plans to offer four new ITS related courses that are relevant to ITS deployment:

1. Intelligent Transportation Systems for Transit: An Overview (2 Days)
2. Improving Transit System Performance: Using Information-Based Strategies (2 Days)
3. Integrating Transit and Highway ITS Applications (2-3 Days)
4. Reinventing Transit: Using Information Technologies to Reinvent Transit Services (2 Days)

In addition, NTI offers NTI Fellows' workshops on Advanced Technologies and Innovations.

NTI has also proposed a long-term program that includes:

- Specific ITS training and education programs for transit and transportation practitioners
- National and regional one-day workshops on ITS “hot topics”
- Expand NTI Internet site to serve as a clearinghouse for ITS programs
- Expand promotional activities for specific ITS training with transit industry groups.

NTI also serves as a member of the PCB National Steering Committee.

### **ITS Professional Capacity Building at Institute of Transportation Engineers (ITE)**

One of ITE’s charter purposes is to “. . . promote the professional development of its members by supporting and encouraging education.” ITE’s current programs related directly to ITS Education and Training include:

1. Development and presentation of professional ITS seminars, in conjunction with U.S. DOT
2. Involving the ITE Specialty Councils in determining seminar topics
3. Membership on the PCB National Steering Committee
4. ITS Operations and Maintenance Conferences
5. ITS Seminar Tours
6. ITS Standards Development

The demand for ITS education and training courses was determined through the following efforts:

1. Member input
2. The Coordinating Council and the Specialty Councils
3. ITE Senior Staff
4. ITE Information Clearinghouse
5. ITE Website
6. FHWA supported courses

ITE has the following education and training activities planned for the near future:

1. Marketing and presentation of existing ITS Courses
2. More ITE Specialty Council involvement
3. Continuing activities as a Standard Development Organization (SDO)
4. Continuing senior staff involvement in ITS education and training

Also, ITE plans to address the following needs within the next five years:

1. ITS Textbooks
2. Better use of the Internet
3. Better use of academic resources
4. Traffic Engineering Certification Program
5. The need for interdisciplinary education and training
6. The need to reach the “Grass Root” Traffic Engineer
7. Better use of existing information networks
8. Better use of technology for education and training purposes



9. More accessible ITS education and training
10. Continuing ITS Awareness courses

### **ITS Professional Capacity Building at ITS University Research Centers of Excellence (RCE) and the ITS Institute**

Three RCE's (Universities of Michigan, Texas A&M and Virginia Tech) and one ITS Institute (University of Minnesota) form this group. The intent of the ITS RCE/Institute Program is to develop a cadre of experienced interdisciplinary transportation researchers, educators, and practitioners that are well versed in the ITS industry. Some of the ITS RCE's and ITS Institute's current PCB programs involving ITS are as follows:

1. ITS Laboratory at the University of Michigan — Involved in evaluations of field operational tests in the region.
2. ITS Deployment Exercise— Educate policy makers about ITS while providing a means for planning deployment.
3. ITS Research Experiences— Undergraduate Summer Fellows and Summer Faculty programs.
4. TransLink Laboratory at Texas A&M — Major public/private partnership test laboratory; focusing on the synergy of linking the various parts of the ITS infrastructure into innovative applications.
5. Education programs at each University.

The demand for education and training was determined through a variety of ways:

1. A review of existing reports on ITS training needs.
2. A survey of existing and planned university programs.
3. A survey of potential ITS employers from both the public and private sector organizations.

The ITS RCE/Institute Program plans to maintain and develop programs by continuing with vigorous development of future transportation professionals. Over the next five years the ITS RCE/Institute program envisions a need in ITS education and training initiatives in two critical areas:

1. The education of the current work/knowledge force.
2. The development relevant course instruction and curricula to educate the future workknowledge force.

One representative from the RCE's and one representative from the ITS Institute are members of the PCB National Steering Committee.

**For more detail on the activities for each of the six organizations summarized above, the reader may refer to the following complete White Papers.**

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# **White Paper on ITS America Education and Training**

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# **White Paper on ITS America Education and Training**

## **Introduction**

The mission of the Intelligent Transportation Society of America (ITS America) is to foster public/private partnerships to increase the safety and efficiency of the surface transportation system through the application of advanced technologies. ITS America's members, who include federal, state, and international government agencies, national and international companies involved in ITS, universities and research institutions, and public interest groups, participate in a variety of ITS research, planning, standards development, deployment, and marketing efforts. The organization:

1. Helps define and develop policies: As a utilized Federal Advisory Committee of the U.S. Department of Transportation, ITS America and its members provide advice and consultation to federal transportation agencies on ITS issues.
2. Serves as a forum: ITS America members participate in more than 20 technical committees, each charged with planning the development and deployment of a particular family of technology applications.
3. Provides input on crosscutting issues: A number of ITS America committees deal with crosscutting challenges to ITS deployment, including institutional and education and training issues.
4. Houses a clearinghouse for ITS information: Access ITS America, the organization's Web site, is the largest database of ITS information in the world.
5. Encourages local and statewide ITS programs: Through its State Chapters Program, the organization is assisting in completing model deployments for ITS and extensive public awareness efforts.

## **Current Programs Underway Directly Relating to ITS**

Given its mission and purpose, all of ITS America's activities are directly related to ITS.

## **ITS Education and Training Programs Underway and Planned for Near Future**

ITS America has launched two primary activities related to ITS Education and Training. They have established a Professional Capacity Building (PCB) Steering Committee and an Education and Training (E&T) Committee. Each is discussed below:

*PCB Steering Committee* is an advisory group to the USDOT's PCB program. ITS America staff (specifically, Donna Nelson, ITS America's Director of Operations) works closely with USDOT's Tom Humphrey on the coordination of this group and participates in the DOT Curriculum Team. A committee roster is attached.

The PCB Steering Committee provides advice to DOT on the format and structure of the Professional Capacity Building Program and program priorities. A university subcommittee has been formed to focus on the "academic" aspects of education and training. This subcommittee

currently has no formal members, but will include representatives from UTCS and Research Centers of Excellence (RCEs). ITS America will be forming another subcommittee to represent consumer and state and local government interests. Other subcommittees may follow as the group matures and additional needs are identified.

To date, the PCB committee has held two meetings. The first of these was primarily organizational and administrative; establishing the committee and determining what activities the committee would undertake. The second meeting focused on a review of the DOT's PCB Strategic Plan. The third meeting is being planned and will focus on reviewing the PCB Implementation Plan.

*Education and Training Committee* was approved by the ITS America Coordinating Council in June 1997. An Education and Training subcommittee of the Institutional Issues committee had been established for a few years. For much of its existence, the subcommittee was largely dormant, but did convene an E&T workshop in June 1995. One of the recommendations of the meeting was that the subcommittee be elevated to full committee status. The E&T committee is chaired by John Mason of the Pennsylvania State University. It is currently in the process of writing a mission statement and soliciting membership. The committee will feature a call for members in the October issue of ITS America News.

The E&T Committee has open membership and complements the work of the PCB Steering Committee. According to Donna Nelson, the committee is not intended to be an "educators" committee. Anyone with an interest and stake in education and training can participate. One objective of the group is to plan and convene an international forum/conference on education and training in 1998. The group also is looking at strategies to integrate ITS into the university and college curriculum. This would include integration of ITS concepts and practices into engineering, planning, business, environmental and other fields.

At the end of October, ITS America will offer a two-day training seminar entitled "Introduction to Positioning Systems" conducted by Professor Chris Drane, of the University of Technology in Sydney, to interested parties. The focus of this course (and others like it developed by ITS America) is to develop a 'knowledgeable consumer.' With the support of private sector vendors, ITS America develops training courses and materials that informs potential customers about ITS systems and technologies, but is not vendor-specific. For example, while Trimble Land Navigation or Nortel might assist in developing a positioning systems course, their products would not be "showcased." Rather, the course would explain what positioning systems are, how they are used for ITS, and what options are available. The hope is that such information will create a better-informed consumer base for all vendors. According to Dr. Nelson, these "customer education" training courses are the private sector's opportunity to create awareness and understanding about ITS technologies and applications in a manner that complements training seminars offered by public sector agencies and associations such as ITE.

This course (developed by ITS America, independently from DOT's PCB Program) and the other PCB courses already developed, are being offered to ITS America constituencies, including State Chapters and state and local government associations (such as the National Governors Association and the U.S. Conference of Mayors). ITS America views its role to be that of a facilitator of the

PCB seminars, training courses developed by other organizations, and training programs developed by ITS America itself. ITS America intends to use its organizational structure and ability to reach a wide variety of constituencies to provide DOT and other groups with audiences for these seminars and assist in the publicity and logistics necessary to conduct the courses. For example, the organization is working with Harriet Smith, the American Public Transit Institute, and the Federal Transit Administration in providing services for the National Transit Institute's ITS training courses.

ITS America's Student Chapters Program continues to grow and is designed to increase awareness of ITS among undergraduate and graduate students, not only among engineering and other transportation-related fields, but also among public administration, business, and other disciplines. The program also provides a link between students and the professional world, and creates peer group and mentoring opportunities. Student chapter members participate in a wide range of chapter, state and national programs and conferences and compete annually for several scholarships offered by ITS America and its members. By introducing ITS career opportunities to these students, and creating an environment in which they can learn from those already in the field, ITS America hopes to build a strong and well-equipped corps of future transportation professionals.

### **Mow Demand for Activities Was Derived**

The PCB program was initiated by DOT in response to concerns raised by stakeholders regarding education and training needs and the need to "mainstream" ITS into transportation planning, operations, construction and maintenance. DOT has commissioned a needs study, primarily focused on USDOT staff, to review ITS training needs.

The E&T subcommittee identified a number of education and training needs during its June 1995 symposium and made a series of recommendations as to how education and training efforts could be initiated, improved, and coordinated. Many of the recommendations were incorporated into the PCB Program and Implementation Plan.

In addition, Coordinating Council members, during recent retreats, highlighted the importance of ITS education and training and this spurred ITSA's involvement in the PCB program.

Donna Nelson, in conjunction with Tom Humphrey of DOT, is currently reviewing what ITS education and training resources, materials, and programs are available to determine how ITS America can best assist DOT in developing necessary training programs, delivering audiences and increasing the accessibility of these materials and programs. As part of this effort, ITS America's State Chapters have been given a menu of PCB course offerings available for presentation.

***ITS Training and Education Initiatives ITS America Feels Must be Addressed:*** Ms. Nelson identified a number of issues, she believes are critical to effective ITS education and training:

1. *Certification and credentialing* -- How does the ITS field ensure practitioners are properly trained in ITS? While Ms. Nelson identified this as a concern, ITS America currently has no explicit plans for tackling the issue. She noted that the Institute of Transportation Engineers

(ITE) is conducting a survey on the issue, the results of which are likely to suggest specific activities to further certification and credentialing. ITS America's Education and Training Committee would consider ways to support ITE's efforts in that regard.

2. *Sustaining ITS* -- Education and training needs are twofold. First, existing ITS professionals must be trained in ITS operations, maintenance, planning, etc. Second, new practitioners entering the field must be trained so that they can enter the transportation field prepared to meet the new expectations of the transportation profession. In both cases, education and training must be on-going so that, as technologies evolve and develop, new business and planning approaches are explored and tested, and legal, administrative, and institutional relationships change, these professionals are equipped to understand and operate in these new environments. This type of training is needed to make ITS accessible and to ensure technologies are sustained over time.
3. *Integrating ITS into university and college curricula*: ITS concepts and practices must be integrated into university and college curricula at all levels and in all relevant disciplines. ITS education must not be limited to transportation engineering, but should be included in public administration, business, planning, systems engineering, environmental and other curricula. This education must go beyond simply providing practitioners with an understanding of the functions, operations and maintenance of specific technologies, and must be extended to provide broader education to facilitate changing public and private attitudes, cultures, and habits. Such education and training must instill new ways of thinking that go beyond "basic" training and that are critical to successful ITS deployment.

### **Plans to Maintain Continuing Education and Training Programs**

- ITS America plans to continue both the PCB and E&T Committee activities.
- The Positioning Systems training course is the first in a series of ITS training courses to be developed by ITS America (or others working with ITS America).
- The organization will expand the number of training seminars available for Annual Meeting attendees.
- ITS America also is considering the development of a scholarship program (similar to ITE's) to encourage greater public sector participation in the courses.

### **References**

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ITS America Membership Brochure, ITS America, 1997.



**Appendix:**  
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# **ITS PROFESSIONAL CAPACITY BUILDING AT THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS**

**A White Paper for the U.S. Department of Transportation  
Federal Highway Administration**

**Prepared by:  
Hal Kassoff**

**under  
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## **ITS Professional Capacity Building at the American Association of State Highway and Transportation Officials**

Members of the American Association of State Highway and Transportation Officials (AASHTO) come from the departments of highways and transportation in the 50 states, the District of Columbia and Puerto Rico. Primarily, the association serves as the national forum for its member departments to address transportation policy and helps them develop guides and standards and engage in research and educational activities that otherwise would not be possible for the departments to do alone. Additionally, AASHTO serves a linkage between the state departments of highways and transportation and the federal government.

### **Current Programs**

AASHTO's involvement in professional capacity building for ITS is varied and growing, though to date, no formal process or structure has been developed. As noted by its Executive Director, AASHTO does not typically sponsor technical courses, preferring instead to work with and through other parties such as FHWA, ITE and the TRB. Each of the activities currently under way at AASHTO is described in detail.

**Highway Subcommittee on Advanced Transportation Systems** - The Subcommittee on Advanced Transportation Systems, under the AASHTO Standing Committee on Highways, includes representatives from every state, and is chaired by Mr. Dave Gehr, Commissioner of Transportation from Virginia. The subcommittee focuses upon ITS applications from the perspective of state DOTs. Included in the charge to the subcommittee is that "it shall identify and assess human resource needs related to such [advanced transportation system] technologies, [and] shall promote appropriate training and education.. . ." Clearly, professional capacity building is central to the subcommittee's fundamental purpose.

Much of the work of the subcommittee to date has been focused on peer group interactions among states. For example, the subcommittee's State Organization Task Force solicits and provides reports on ITS deployment activities among the various states, with special emphasis on innovative projects and programs. Through meetings and activities of the subcommittee and its task forces there is a considerable amount of peer-to-peer information exchange occurring, and a percolation process in which best practices in the ITS arena emerge and receive considerable attention.

The subcommittee has also sponsored special briefings for the AASHTO Board of Directors (comprised of all state DOT CEO's) on key policy topics related to ITS. Recent subjects include the policy implications of telecommunications decisions by state DOTs and the opportunity to barter access to highway rights-of-way in exchange for telecommunications resources required for both ITS and for DOT business applications. These interactions among key staff and senior management of state DOTs serve to expand the knowledge base of all participants and are an essential part of professional capacity building.

**Task Force on Partnerships for Traffic Management Software Development** - This special task force created as a result of the perception that significant problems, including limitations in staff capabilities at state DOTs, exist in the specification, procurement, management and installation of traffic management software — software at the technological heart of ITS deployments. The task force will report this fall on an array of recommendations — and professional capacity building measures are expected among them.

**ITS Standards Development Oversight Committee** - AASHTO is one of five national groups designated by United States Department of Transportation (US DOT) as an ITS standards setting organization. The premier effort to date has involved the National Transportation Communications ITS Protocol (known as NTCIP). The professional capacity building issue raised by this effort involved the need to find within the DOTs, staff who have a sufficient in-depth grasp of the telecommunications and electrical engineering aspects of this proposed standard to be in a position to provide useful analyses, insights and recommendations. The NTCIP initiative has appropriately resulted in a substantial expansion of AASHTO's technical realm into new areas.

**AASHTO Leadership of Professional Capacity Building Steering Committee** - The US DOT, working with ITS America in its role as a Utilized Federal Advisory Committee, put together a broad based Steering Committee to guide the department on the planning and delivery of a formal ITS professional capacity building program. Significantly, from AASHTO's perspective, the chair of the committee is the Commissioner of Transportation from Georgia, Mr. Wayne Shackelford. (Commissioner Shackelford is also a former president of AASHTO and is Vice-Chair of the ITS America board. His leadership was instrumental in the successful deployment of Atlanta's advanced traffic management systems and traveler information systems for the 1996 Olympic Games.)

Also, representing AASHTO on this important group is the chair of the subcommittee on Advanced Transportation Systems, Mr. Dave Gehr, Virginia's Transportation Commissioner. This is particularly important in terms of Chairman Gehr's desire to have the future work of his Subcommittee rooted in the framework of the Professional Capacity Building Steering Committee.

This Professional Capacity Building Steering Committee, as an umbrella group, plans to define, prioritize, advise, and coordinate the delivery of education and training activities in the ITS area by US DOT and other participating stakeholders such as AASHTO.

**ITS Resource Guides** - In 1996 AASHTO published "Guidance on Sharing Freeway and Highway Rights-of-Way for Telecommunications" which has received favorable comment as a resource to professionals in member departments dealing with this complex issue. This document is a possible model for future publications intended to assist staff in member departments deal with non-traditional issues in the realm of ITS.

**Scanning Tours** - Along with other national associations, and with the financial support of the Federal Highway Administration, AASHTO has co-sponsored a number of domestic and international scanning tours of ITS installations. These have proven to be of immeasurable value for participants at all levels — from the front line to the front office. A number of CEOs of member departments has been motivated by these visits to advance ITS initiatives in their own agencies. Equally important, these site visits provide the opportunity for the staff responsible for delivering the ITS mission to interact with peers, and learn from their experience.

**Interdisciplinary Awareness** - ITS applications affect and involve more than just traffic operations and traffic management. Recently, in recognition of this, the Highway Subcommittee on Maintenance included in its annual meeting agenda a briefing on ITS applications that both affect and offer opportunities for highway maintenance personnel. A possible follow up may involve the creation of a joint task force between this subcommittee and the Subcommittee on Advanced Transportation Systems to address issues that cut across both areas, which would undoubtedly involve professional capacity building activities.

(Another ITS interdisciplinary opportunity would be to strengthen the ties between motor carrier staff involved in the commercial vehicle operations area and traffic operations staff involved in advanced traffic management.)

## **Future Programs**

AASHTO's future activities in ITS professional capacity building involve a continuation of the basic approach that has been set. Each of these activities is explained in detail.

**Professional Capacity Building Steering Committee** - In the area of formal training and education courses, as mentioned earlier, the AASHTO approach is to work cooperatively with others, focusing on the Professional Capacity Steering Committee to serve as the overall coordinator. The committee will continue to meet state DOT formal training needs by emphasizing training within the US DOT so that DOT staff may better assist in working with state and local transportation professionals.

**Advanced Transportation Systems Subcommittee** - The agenda for the next meeting of the Advanced Transportation Systems Subcommittee is now being put together for the meeting in Kansas City at the end of September. A possible item under consideration involves the option of a more formalized process of defining ITS professional capacity needs among state DOTs, and identifying ways of meeting those needs. Chairman Gehr, as well as AASHTO's Executive Director, Mr. Frank Francois, has indicated an interest in having this issue before the subcommittee.

**Task Force on Partnerships for Traffic Management Software Development** - Included on the agenda of the subcommittee will be a report and recommendations from the Task Force on Partnerships for Traffic Management Software Development. It is expected that included in the task force recommendations will be the initiation of a professional capacity building effort to enhance the ability of State DOTs in this area.

**Continuation of Scanning Tours** - Conducting scanning tours to existing and operational sites appears to be universally regarded as invaluable, and is expected to continue and hopefully expand.

## **Program Demand**

AASHTO activities in the area of ITS professional capacity building have evolved in response to issues and problems rather than as a result of a formal process. For example, when it was apparent that a number of states were experiencing staff capability problems in the procurement and management of ITS systems integration software, a special task force was assembled to deal with the issue. Similarly, when telecommunications resource sharing became an area of common interest, with limited experience among staff in most DOTs, a resource guide was prepared. The ad hoc approach works well and is effective in its versatility and timeliness.

AASHTO is well aware of the option to conduct a more formalized approach to determining ITS education and training needs and priorities. Such an approach was undertaken by the I-95 Corridor Coalition (which spans 13 states and the District of Columbia) and is manifested in its "Project 1 1 - Training and Technology Exchange" Final Report published in August of 1996. (This is an excellent reference in the area of ITS related education and training needs and resources.) The question for AASHTO, given the diversity among member state DOTs in the nature and level of their interests and in their level of capability in ITS applications, is whether the time, cost and effort required to initiate and sustain such a formal approach makes sense at a national scale. If additional work such as this were to be undertaken in this area, a possible resource for assisting might be AASHTO's Administrative Subcommittee on Personnel and Human Resources.

## **Long Term Program Needs**

Those who were interviewed for this white paper from AASHTO, FHWA, and from individual states offered the following cogent observations about what should lie ahead for AASHTO and state DOT ITS professional capacity building over the next 5 years:

- There is a glaring need for project management level people who are skilled in procuring and managing multiple consultant and contractor relationships involved in ITS deployment.
- There is a strong need to improve professional capacity in the areas of telecommunications and in the procurement of ITS applications - particularly in terms of negotiating skills.
- Virginia, through the work of an internal task force, has identified "ITS Training Focus Areas" for FY 1998. They are likely to be indicative of similar needs elsewhere, though no two agencies can be expected to have identical needs. Virginia's initial priority list includes:
  1. Managing and inspecting ITS contracts;
  2. ITS system design;
  3. Fundamentals of communications;
  4. Fundamentals of information technology;
  5. ITS primer;
  6. ITS and local government;
  7. Executive awareness of ITS;

- 8. ITS case study courses(s); and
  - 9. Electronic and information security.
- The priority areas for ITS training identified by the I-95 Corridor Coalition study are:
    - 1. Computer systems;
    - 2. Communications systems;
    - 3. Incident management;
    - 4. Variable message signs; and
    - 5. Closed circuit television.
  - DOTs will continue to vary in how they blend together in-house and outside resources for deployment and operation of ITS. Those that tend to develop and retain this expertise internally will have a different set of needs in the professional capacity building area from those that plan to rely more upon outside assistance.
  - Retraining civil engineering professionals and technicians to become the “hands-on” electrical, communications, and systems engineers producing ITS may not be the best approach. Increasingly, states are turning to the private sector for development, deployment, and operations of ITS services, while they procure and manage these private resources with in-house people who can be educated, trained, and re-trained with a foundation of basic knowledge in these areas.
  - State DOTs must accept the need for staff positions dedicated to ITS functions, even where the private sector is heavily involved. As a minimum, they are needed to manage the procurement and monitor the work of consultants and contractors.
  - Part of professional capacity building should be met by recruiting professionals in fields such as computer science and electrical engineering.
  - To recruit and retain some of the most essential people needed to work in ITS applications, state personnel systems must come to grips with the need to properly classify and adequately compensate those working in ITS whose background may involve critical specialty areas different from traditional civil engineering.
  - The National Highway Institute will be an increasingly important resource for FHWA and AASHTO members in their ITS training and development efforts.
  - It is important to provide ITS educational opportunities at the university level through a variety of means, including undergraduate courses, graduate programs, and special courses. Universities can play an important role in delivery of training services to state DOTs.
  - Education and training in the ITS area cannot be a “one size fits all” given the tremendous variation among, and even within, state DOTs.



- ITS education and training programs will evolve, generally growing more sophisticated and targeted as entry level people come into DOTs with more advanced knowledge and as current staff becomes more adept.

### **Long Term Program Plans**

AASHTO intends to continue and expand its involvement with ITS professional capacity building.

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**ITS PROFESSIONAL CAPACITY BUILDING  
AT THE  
AMERICAN PUBLIC TRANSIT ASSOCIATION**

**A White Paper for the U.S. Department of Transportation  
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**Prepared by:  
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Orbital Sciences Corporation  
  
under  
Science Applications International Corporation  
  
Contract DTFH 61-96-C-0047  
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## **ITS Professional Capacity Building at the American Public Transit Association**

The American Public Transit Association (APTA) is the international organization representing the transit industry. APTA's mission is to serve and represent its 1,100 members in making public transportation an effective path to economic opportunity, personal mobility, and improving the quality of life through partnerships, communication, technology, and advocacy.

### **Current Programs**

APTA is a charter member of the USDOT Joint Program Office Steering Committee on Professional Capacity Building (PCB). As a strong voice for its transit constituency, APTA has provided consistent representation and support to the PCB program to find ways to increase the understanding of ITS applications and deployment within the ranks of transit professionals.

APTA currently conducts ITS training and education activities in three distinct areas:

- National conferences,
- Publications, and
- ITS Advocacy.

In addition, APTA has two programs designed to collect and disseminate information to the transit community:

- Transit Cooperative Research Program, and
- Transit Research Innovation Program.

The activities in each of three areas and the purpose and scope of the two programs are discussed in tllm.

**National Conferences** - APTA sponsors three major technical conferences each year as well as an annual meeting. Each conference has a special technology 'track' that features panelists who address specific technology areas, including ITS technologies that impact the future of transit. Each technical conference features exhibits where public and private sector organizations demonstrate state-of-the-art technologies for bus, rail, or intermodal applications. APTA's three annual technical conferences are:

- Commuter Rail Conference;
- Bus Operations, Technology, Management Conference; and
- Rapid Transit Conference.

APTA's annual meeting also has a series of 'tracks' that often focus on technical issues. Every three years the Annual Meeting is a world class exposition where more than 600 suppliers showcase their services and equipment.

In addition, APTA sponsors an annual TransiTech Conference on computer technologies in public transportation, which usually occurs at the end of the Annual Meeting. This 2 day event features workshops and discussion forums on software and computer equipment widely used by bus, rail, and paratransit providers.

**Publications** - APTA publishes and distributes targeted information, including ITS information, to its 1,100 members through the following publications:

- ***Passenger Transport (PT)*** is a weekly publication that communicates news and information about public transportation. An annual “In Focus” edition of *Passenger Transport* is devoted to Intelligent Transportation Systems applications in transit. Throughout the year, *Passenger Transport* features ITS related transit topics as information articles that educate the reader about ITS deployments, as news articles that report on ITS technologies, and as commentaries that generate discussion about ITS.
- ***Intelligent Transportation Systems and Public Transit*** is a brochure that describes transit-related ITS projects throughout the United States, as well as a brief description of financial and customer related benefits of ITS applications.
- **Technical Reports, Special Issue Briefs, and Legislative Updates** on specific transit related topics, including ITS, are prepared and distributed throughout the year as information to the transit community and to APTA members.
- **Conference Proceedings** of each technical conference include published papers on ITS topics that are presented at the ITS technical sessions. The full proceedings of each conference are available in hard copy or can be downloaded via APTA’s home page.

**ITS Advocacy** - APTA sponsors an annual Legislative Conference that addresses and supports the ITS program. APTA’s legislative updates regularly inform the transit community of federal and state actions, including ITS re-authorization, that impact their operations. APTA regularly gathers transit success stories and prepares congressional testimony that addresses ITS related transit issues.

**Transit Cooperative Research Program (TCRP)** - APTA is the designated distribution center for the Transit Cooperative Research Program of the Transportation Research Board. Utilizing its extensive database, APTA notifies the transit community of all TCRP activities, including publicizing TCRP’s ITS research agenda, soliciting ITS research proposals, distributing ITS project summaries, and distributing research reports upon faxback request from members.

**Transit Research Innovation Program (TRIP)** - TRIP is a new APTA program intended to broaden, strengthen, and accelerate the introduction and adoption of TCRP sponsored research results within the transit industry through activities conducted by specially appointed TRIP Ambassadors. The TRIP Ambassadors are available to public transportation providers for one-on-one consultation to explore the latest developments in advanced technologies.

## Future Programs

APTA has three new initiatives to expand its current ITS training and education activities. The initiatives are in the following areas:

- Information dissemination;
- National technical conferences; and
- Publications.

Each new initiative is discussed in turn.

**Targeted Dissemination of ITS Information** - APTA plans to ask each member organization to designate an "ITS representative" who will serve as the lead organizational point person on ITS matters. The ITS representatives will be invited to work with APTA on ITS matters.

**National Technical Conferences - ITS Sessions** - APTA plans to expand the number of technical sessions that feature ITS technologies and applications at the annual Commuter Rail Conference; the Bus Operations, Technology, Management Conference; and the Rapid Transit Conference.

**Publications** - APTA plans to expand coverage of ITS transit related topics in *Passenger Transport* and to publish additional ITS informational publications such as *the ITS Public and Transit* brochure.

## Program Demand

APTA's ITS activities were developed in response to feedback solicited from its members through direct mail questionnaires on specific topics and through evaluation surveys following each national or regional event. Both national ITS program needs and member needs are taken into consideration when preparing informational materials and planning conferences, workshops, or meetings that include special ITS sessions.

APTA members support an extensive committee and sub-committee structure that addresses transit related topics for maintenance, operations and technical professionals. ITS deployment and associated issues are routinely included as regular agenda items at APTA's national and regional committee meetings. For example, the Standing Committee on Fare Collection or the Standing Committee on Bus Equipment routinely address state-of-the-art ITS applications and the recurring need for appropriate training and education. Input from the committees on ITS training/education needs flows through APTA staff to the Professional Capacity Building Committee.

Additionally, ITS America (ITSA) and APTA are currently developing a Memorandum of Understanding that will, on a trial basis, offer to both APTA members and ITS America members the opportunity to participate in a newly configured "Co-Sponsored APTS Committee". Under such an arrangement, APTA and ITSA will create a joint committee roster that will allow the two organizations to offer the transit community many *new* training and education offerings such as jointly sponsored workshops, seminars, case study sessions, etc. Most important, training and education activities will be coordinated between APTA and ITSA in order to avoid duplication and

overlap in programming. The “Co-Sponsored APTS Committee,” with its direct access to members of the transit community, will likely become an excellent vehicle for soliciting and collating information on transit training and education needs for ITS deployment. Integrating NTI’s transit training/education input with APTA/ITSA data should provide a comprehensive profile of the needs of the transit community. Once a comprehensive profile of transit needs is established, it could naturally lead to the compilation of a *Transit Training and Education Catalogue* that will allow transit managers to select the most appropriate professional capacity building options for their staff

### **Long Term Program Needs**

APTA intends to refine and expand its ITS information dissemination activities over the next 5 years as follows:

- Develop and deliver a more ambitious ITS transit related program of activities that educates the transit community, as well as APTA members, of ITS technologies and innovations;
- Work more closely with FTA and FHWA to define the ITS transit related needs of the transportation community; and
- Serve as a clearinghouse for information dissemination about all training and education programs that are of interest to the transit community.

### **Long Term Program Plans**

APTA intends to continue and expand its current ITS education and training programs.

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# **ITS PROFESSIONAL CAPACITY BUILDING AT THE NATIONAL TRANSIT INSTITUTE**

**A White Paper for the U.S. Department of Transportation  
Federal Highway Administration**

**Prepared by:  
Lawrence Schulman and Marsha Scherr  
Orbital Sciences Corporation**

**under  
Science Applications International Corporation**

**Contract DTFH 61-96-C-0047  
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## **ITS Professional Capacity Building at the National Transit Institute**

The National Transit Institute (NTI) is located at Rutgers, The State University of New Jersey, and is funded through a cooperative agreement with the Federal Transit Administration. NTI provides both free and fee-based training and education programs to the transit industry. Training and education activities that are specific to Intelligent Transportation Systems are developed within the “Advanced Technologies and Innovative Practices” (ATIP) program area.

### **Current Programs**

NTI currently offers a variety of training and education courses that contain an ITS component. The ITS related courses fall into three program areas:

- Advanced Technologies and Innovative Practices;
- Multi-Modal Transportation Planning; and
- Management and Supervisory Courses.

NTI's current and anticipated ITS related courses were widely promoted in APTA's August 1997 special feature on *Intelligent Transportation Systems in Transit* and in the *ITS America APTS Quarterly*, Summer 1997.

Advanced Technologies and Innovative Practices Program Area - Two existing courses in this program area specifically address ITS issues:

- **GIS: Transit Applications** - This 3 day course is designed for those who are not sure what Geographic Information Systems (GIS) can do for their agency or regional consortia or have not already made decisions about which software package(s) to use. The course is currently offered on a demand basis.
- **Procuring New Technologies for Transit** - This 2 day intensive course teaches a nine-step systems approach to the procurement of technologies that have potential implications for the functioning of entire organizations. The majority of case studies are in ITS applications. The course is scheduled for June, September, October, November in 1997.

Multi-Modal Transportation Planning Program Area - The six courses in this program area that contain some ITS components are:

- **Public Involvement in Transportation Decision making** - This 2 1/2 day course teaches planners, engineers, and public involvement specialists how to integrate the public into all phases of planning, programming, and project development. The essential message is that successful public involvement efforts start early in the planning process and employ a variety of techniques at all stages to clearly spell out agency and public roles. The course is currently offered on a demand basis.



- **Financial Planning and Programming for Metropolitan Planning Organizations** - This 3 day course is designed to help state DOTs and regional MPOs respond to new requirements for improved financial planning and fiscal constraints imposed by ITSEA as well as metropolitan and statewide transportation planning regulations. This course is especially appropriate for progressive MPOs and transit practitioners who are deploying ITS technologies into their system. In 1997, this course is scheduled for August and October and on a demand basis through 1998.
- **Introduction to Metropolitan Transportation Planning** - This course is intended for the transit authorities, DOTs, DPWs, and general and special purpose planning agencies at the local, regional, and state levels. This course is ideal for senior level ITS practitioners who need to manage their ITS projects through the TIP planning process. This 2 day course is scheduled for October 1997 and new sites are actively being sought in order to schedule up to 25 new sessions through December 1998.
- **Major Investment Studies** - This 3 day course targets MIS managers from MPOs, transit agencies, and state or regional DOTs. It is also appropriate for federal staff from regional and division offices. Two sessions are scheduled in 1998, with additional sessions to be offered on a demand basis.
- **Statewide and Metropolitan Transportation Program Development** - This 2 1/2 day course is targeted for MPOs and member agency staff who need to integrate ITS deployment projects into the planning and funding pipeline. The course is scheduled to be offered monthly from Spring 1998 to December 1998. Thereafter it will be available on a demand basis.
- **Market Segmentation for Transit** - This course is currently under development and is being designed to aid transit agencies in identifying customer needs and available technologies and services to meet them. It is scheduled for delivery Fall 1998.

**Management and Supervisory Program Area** - NTI offers an integrated series of management and supervisory training programs that are appropriate for transit professionals who are preparing for their next level of supervision or management, including the deployment of ITS technologies. Courses within this program area are offered for first-level supervisors, mid-level managers, or senior-level managers. Courses range from 1-3 days and are typically scheduled upon request.

A special Professional Development Curriculum is also available for Transit Trainers or Educators and is typically scheduled upon request.

### **Future Programs**

NTI plans to offer four new courses that are relevant to advancing ITS deployment. Additionally, there is a Fellows program, designed to bring expertise out to the field. The new programs are:

- **Intelligent Transportation Systems for Transit: An Overview** - This 2 day training course is a primer on information technologies available to improve transit operations, customer service, planning, scheduling, fare collection and the cost-benefit analysis needed to justify the new

technologies.. It includes the concept of incremental installation to **maximize the** early benefits from both real-time and stored data. Case studies from actual deployments provide practical guidance and insights from the participants' own situations are encouraged. The course will be offered up to 16 times between January 1998 and December 1999.

- **Improving Transit System Performance: Using Information-Based Strategies** - This 2 day course addresses how to use effectively the unprecedented quantity and quality of data from ITS systems. It is designed so persons from different departments with disparate responsibilities may identify common needs and work towards consensus on how to distribute, process and analyze information within the larger organization. This course will be offered up to 16 times between January 1998 and December 1999.
- **Integrating Transit and Highway ITS Applications** - This **2-3** day course includes the basics of information theory and how the type, timing, and location of information affects travel behavior. It is also designed to allow persons from different modal agencies to compare the information and infrastructure sharing possibilities. This course presupposes some prior knowledge of information technologies for either transit or highway systems. This course will be offered up to 16 times between January 1998 and December 1999. Some of the offerings will include a tour of the host's facilities.
- **Reinventing Transit: Using Information Technologies to Reinvent Transit Services** - This 2 day course is designed to help break down institutional barriers that may block the introduction of new services. Techniques for improved coordination and combinations of services resulting from the introduction of information technologies will be discussed, using case studies and personal experiences of participants. This course will be offered up to 16 times between January 1998 and December 1999.
- **NTI Fellows' Workshops on Advanced Technologies and Innovations** - These half-day workshops are designed in consultation with distinguished industry Fellows in order to introduce advanced technologies, many of which are ITS related, and innovative ideas to the transit community. The workshops are offered free of charge to participants. The ITS related Fellows' workshops include:
  - Geographic Information Systems
  - Procurement of Automatic Vehicle Location Systems
  - Procurement of Advanced Technologies
  - Are you ready for AVL?

### **Program Demand**

Demand for current NTI programs was initially developed based on input from an industry defined Advisory Committee with broad representation from government, universities, transit operators, consultants, private organizations, planning organizations, state DOTs, and other transportation organizations.

Subsequently, a Curriculum Committee was formed, with representatives from government, academia, and practitioners in the ITS transit community to help determine the specific ITS training and education subject areas.

To identify demand for ITS related deployments, NTI created the Advanced Technologies and Innovative Practices (ATIP) program area in order to develop and deliver ITS training and education courses directly to transportation organizations. A special ATIP Curriculum Committee was formed.\*

Once training and education programs are introduced to the transportation community as ‘pilot courses, they are further refined with input from selected members of the Curriculum Committee and from course participants.

Demand for ITS transit courses is coordinated with USDOT’s FTA and Joint Program office on a programmatic basis. Representatives from both the FTA and the Joint Program office are active participants in both NTI’s ATIP Advisory Committee and the USDOT’s Professional Capacity Building Committee. However, course developers do not necessarily coordinate individual course content.

### **Long Term Program Needs**

The demand for future ITS related courses will be determined in a manner that is similar to the way demand for current courses was determined, i.e., through Advisory Committees and through feedback from course participants.

During the next five years, the following ITS specific training and education activities are being planned:

- Develop and deliver additional specific ITS training and education programs for transit and transportation practitioners.
- Develop and deliver national and regional one-day workshops on ITS ‘hot topic’ areas.
- Expand NTI Internet site to serve as a clearinghouse for all ITS training and education programs.
- Expand promotional activities for specific ITS training and education courses with APTA, CTAA, Project ACTION, and state transit associations.

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\* Members of the ATIP Curriculum Committee include: Ronald Baker (CTA), Joseph John (PACE), Mac Lister (USDOT ITS Joint Program Office), Paula Okunieff (Cambridge Systematics), Stephen Anderle (TCRP), Michael Bolton (NC State University, ITS Institute), Ron Kangas (USDOT FTA), Judy McGrave (Community Transit, Delaware County, PA), David Partain (MARTA), Louis Sanders (APTA), Denis Symes (USDOT FTA), Michael Townes (Peninsula Transportation District, Hampton Roads VA), John Stone (NC State University), and Paul Tolliver (King County, Seattle DOT).

## **Long Term Program Plan**

NTI intends to continue and expand its involvement with ITS training and education activities.

## **Acknowledgments**

The contributions of the following people are appreciated:

Eric Bruun, NTI, Advanced Technologies and Innovative Practices Program Area

Neal Denno, NTI, Multi-Modal Transportation Planning Program Area

Donald Miklas, NTI, Management and Supervisory Program Area

**White Paper on**

**ITS Training and Education Activities**  
**of the Institute of Transportation Engineers**

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## ITS Training and Education Activities of the Institute of Transportation Engineers

The purpose of this paper is to describe and document the current and planned activities of the Institute of Transportation Engineers (ITE) concerning ITS education and training programs.

The Institute of Transportation Engineers is an international, individual membership, scientific and educational association. Its purpose is to enable engineers and other professionals with knowledge and competence in transportation and traffic engineering to contribute individually and collectively toward meeting human needs for mobility and safety, and to **promote the professional development of its members by supporting and encouraging education**, stimulating research, developing public awareness, and exchanging professional information.

ITE programs include technical publications, standards development, technical committee research and projects, professional development seminars, training, and local, regional and international meetings, including its Annual Meeting and Mid-Year Conference. ITE publishes the *ITE Journal*, a peer-reviewed publication containing technical articles and educational information. ITE also has more than 80 local and regional chapters and more than 90 student chapters that provide additional opportunities for information exchange, participation, and networking. Active ITE members may participate in technical projects and product development activities through involvement in one of eleven Specialty Councils (ITE members grouped by area of expertise and interest). Although most Specialty Councils have an ITS component, the ITS Council, Traffic Engineering Council, and the Transit Council are the ones that are directly related to ITS education and training.

### Current Programs Directly Related to ITS Education and Training

#### ITS Seminars

As part of its Professional Development Program, ITE develops and presents professional seminars and other learning activities on topics of interest to ITE members. ITS and Traffic Calming are considered key areas for ITE in 1997.

ITE sees itself with a specific role in delivering ITS seminars: to provide “quick,” short seminars that respond to an immediate need. Their objective is to provide awareness-type courses that can broadly educate participants on a given subject, and seminars that can provide specific tools to the attendees. ITE set the following objectives for its 1997 seminars program:

- Present at least 12 seminars and other learning activities
- Schedule seminars in conjunction with ITE international and district meetings to minimize the need for additional travel/funds to attend
- Leverage available funds to keep seminar registration fees as low as possible while still covering ITE direct and indirect costs
- Involve the ITE Specialty Councils in determining seminar topics and in developing and delivering seminars.

Table 1 is a listing of seminars presented to date or currently scheduled to be presented during 1997. ITE Councils played an integral part in defining topics and in sponsoring and delivering these seminars. Most of the ITS seminars have been subsidized with funds from ITE/FHWA contracts, keeping registration fees under \$100 per day.

Over 20 ITE districts, sections and chapters responded to a June 1997 solicitation expressing interest in sponsoring ITS seminars made available through ITE and FHWA. ITE Headquarters is currently working with the USDOT Volpe Center to arrange for scheduling and delivery of these seminars. Under this arrangement, ITE will use FHWA funding to pay for the instructors (selected from a pre-determined pool of instructors), materials, and any significant audio-visual costs. The sponsoring district, section or chapter will be responsible for the site logistics, attendees, and registration. Districts, sections and chapters may choose to charge a registration fee to cover these on-site costs or to offer the seminar as part of their meeting programs.

**Table 1. 1997 ITE Professional Development Activities Schedule  
(ITS-related activities only)**

<b>Date</b>	<b>Venue</b>	<b>Seminar</b>	<b>Fee/Subsidy/ Sponsors</b>	<b>Attend.</b>
3/22-23	ITE Tampa Conference	Conference on O&M of ITS Field Devices	Fee: \$95 Sponsors: ITS, Industry, and Traffic Engineering Councils. Subsidy: FHWA	80
3/23	ITE Tampa Conference	Symposium on Commuter Response to ATIS	Fee: \$85 Sponsors: TDM, Transit and ITS Councils Subsidy: FHWA	60
3/6-7	TTE Tampa Conference	NTCIP-What Does It Mean for You?	Fee: \$65 Sponsor: ITS Council Subsidy: FHWA	60
4/16	ITE Virginia Section Meeting	The Internet for Transportation Professionals	Fee: Part of meeting registration Sponsor: Virginia Section Subsidy: FHWA	40
5/14	ITE District 1 Annual Meeting, Saratoga, NY	NTCIP-What Does It Mean for You?	Fee: Part of meeting registration? Sponsor: ITS Council, District 1 Subsidy: FHWA	20
8/2	ITE Annual Meeting, Boston	Telecommunications for Transportation Engineers	Fee: \$95/\$125 Sponsor: ITS Council Subsidy: FHWA	20

8/3	ITE Annual Meeting, Boston	NTCIP-What Does It Mean for You?	Fee: \$65/\$95 Sponsor: ITS Council Subsidy: FH WA	20
8/7	ITE Annual Meeting, Boston	Advancing Public Transportation Systems Using TCIP	Fee: \$65/\$96 Sponsor: Transit & ITS Councils Subsidy: FTA	20
9/11	ITE Georgia Section Meeting, Atlanta, GA	ITS Partnerships	Sponsor: ITE Georgia Section Subsidy: FH WA	??
9/17	ITE Missouri Valley Section Meeting, Omaha, NE	NTCIP-What Does It Mean for You?	Sponsor: ITE Missouri Valley Section Subsidy: FHWA	??
9/18	ITE Intermountain Section Meeting, Helena, MT	Planning for Rural ITS Deployment	Sponsor: ITE Intermountain Section Subsidy: FHWA	??
9/23	ITE Texas Section Meeting, Houston, TX	NTCIP-What Does It Mean for You?	Sponsor: ITE Texas Section Subsidy: FHWA	??
9/24	ITE Mid-Atlantic Section Meeting, Hershey Lodge, PA	NTCIP-What Does It Mean for You?	Sponsor: ITE Mid-Atlantic Section Subsidy: FHWA	??
10/2	ITE Virginia Section Meeting, Roanoke, VA Telecommunications	ITS Telecommunications	Sponsor: ITE Virginia Section Subsidy: FHWA	??
10/10	ITE Deep South Section Meeting, Vicksburg, MS	NTCIP-What Does It Mean for You?	Sponsor: ITE Deep South Section Subsidy: FHWA	??
10/15	ITE Mid-Atlantic Section Meeting, King-of-Prussia, PA	ITS Awareness	Sponsor: ITE Mid-Atlantic Section Subsidy: FHWA	??
10/23	ITE Ohio Section Meeting, Columbus, OH	NTCIP-What Does It Mean for You?	Sponsor: ITE Ohio Section Subsidy: FHWA	??
11/4	ITE Oregon Section, Portland OR	NTCIP-What Does It Mean for You?	Sponsor: ITE Oregon Section Subsidy: FHWA	??



11/13	ITE Illinois Section Meeting, Chicago, IL	NTCIP-What Does It Mean for You?	Sponsor: ITE Illinois Section Subsidy: FHWA	??
10/29	ITE Alabama Section Meeting, Birmingham, AL	ITS Awareness	Sponsor: ITE Alabama Section Subsidy: FHWA	??
11/10-14	San Antonio, Houston, Phoenix	ITS Seminar Tour: North America 97	Fee: N/A Sponsor: ITS Council Subsidy: FHWA	15
11/17	ITE Upstate New York Section Meeting, Latham, NY	Planning for ITS Deployment	Sponsor: ITE Upstate NY Section Subsidy: FHWA	??
12/1	ITE New England Section Meeting, Warwick, RI	ITS Telecommunications	Sponsor: ITE New England Section Subsidy: FHWA	??
12/12	ITE Texas Section Meeting, Dallas, TX	ITS Awareness	Sponsor: ITE Texas Section Subsidy: FHWA	??

### **ITS O&M Conferences**

In addition to those seminars, ITE has a series of activities related to ITS Operation and Maintenance (O&M) that have an education and training component. For the past four years, and as part of its annual meetings and mid-year conferences, ITE has organized a series of ITS O&M workshops and seminars. The purpose of these workshops is to generate input relative to the needs in the O&M arena. As a result of this input, ITE is developing a series of recommended practices related to ITS O&M, including education and training activities. For example, ITE is currently developing a seminar on how to operate and maintain ITS systems.

### **ITS Seminar Tours**

ITE seminar tours are also an important component of ITE's ITS educational and training program. The purpose of these week-long tours is to expose participants to deployed ITS technology and to educate them on the state-of-the-art. ITE encourages public sector participation in these tours through scholarships. To date, ITE has conducted seminar tours in Japan (2), Europe (2), and the United States (2). Another tour is planned for this Fall (San Antonio, Houston, Phoenix).

### **ITS Education and Training Activities Planned for the Future**

The following ITS education and training activities are planned for the near future:

- ITS Council Newsletters: The Institute published a newsletter which is distributed approximately four times a year to its 750 ITS Council members. The newsletter brings

members up to date on ITS programs and projects, **tiding**, meetings, training and other topics. Special topic newsletters on NTCIP and TCIP are also distributed to ITE ITS Council members.

- ITS Listserve: In early 1997, the Institute initiated an internet listserve on ITS. Over 350 persons now subscribe to the listserve. The ITE ITS listserve allows members to quickly poll the 350 subscribers to obtain answers to questions on technical and program issues relative to ITS.
- ITS Deployment Partnership Network (IDPN): The Institute is in the process of initiating the IDPN. The IDPN is a new shared Internet-based resource designed to facilitate broader, more interactive, and more up-to-date communication and sharing of ITS initiatives, findings, results, and “lessons learned” among federal, state, and local transportation practitioners, technologists, and consultants. The IDPN initiative will help disseminate timely, ITS-related information generated by the U.S. DOT and by the national organizations participating in the Partnership.

With guidance from the partner associations, the Institute will provide each of the partner associations with an ITS web page that will automatically be incorporated into each association’s web site. This will ensure that each association has a more complete and up-to-date ITS presence on its website than would be possible for each association to provide independently. The IDPN will also provide the U.S. DOT and others with a mechanism to immediately disseminate important ITS information to the members of the partner associations.

- More Specialty Council Involvement: For the immediate future, ITE plans to make its Specialty Councils more involved in the ITS education and training areas, by both identifying needs and developing educational programs. For example, ITE considers it critical that members become aware of the roles of and challenges to ITS system integrators and software developers and vice versa. The ITS Council may be charged with developing a course that addresses this need.
- Continuing Activities as a Standard Development Organization (SDO): ITE will continue to assist with the development of ITS standards, including developing education and training for the standards they develop.
- Continuing Senior Staff Involvement in ITS Education and Training: ITE senior staff will continue to participate in many education and training activities including FHWA’s Professional Capacity Building Program (PCB), AASHTO, ITS America.

## **ITS Education and Training Needs Assessment**

The demand for these ITS education and training courses is derived in a variety of ways:

- Member Input: ITE regularly surveys its members to identify “hot topics” or areas where members feel an education and training deficiency exists. ITE staff translates the findings either into projects to be done internally or by assigning projects to the designated Specialty Council.
- The Coordinating Council and the Specialty Councils: At their meetings, the councils’ leadership is constantly procuring ideas for areas where education and training activities are needed. Specialty Councils also survey their membership for ideas and projects-

- ITE Senior Staff ITE senior staff is aware of areas that are deficient. They gather this information through frequent contacts with ITE members and through their liaison activities. For example, Mr. Thomas Brahms is a member of the PCB Steering Committee and a member of the ITS America Board. Because of his involvement with those groups, he has a clear picture of the status and needs in the ITS education and training areas. Mr. Mark Norman is the ITE Staff Liaison to the ITS Council. In that capacity, he works closely with the Council in identifying seminars and other educational activities.
- ITE Information Clearinghouse: ITE staff responds to hundreds of technical questions every month. The staff keeps a daily log that is used to identify trends and deficiencies and translate those into educational programs.
- ITE Website: Through the ITE website, members and visitors leave messages and questions that are also used to determine needs in the Professional Development Program. ITE is currently planning to expand their website to allow for cataloging of information. This catalog will also be used to assess needs in the ITS education and training areas.
- FHWA Supported Courses: The courses to be developed and presented by ITE were determined by the FHWA as part of the PCB program. Mr. Brahms, as a member of the PCB Board participated in the assessment of the courses.

### **ITS Training and Education Activities that ITE Feels Must be Addressed Within the Next Five Years**

- ITS Textbooks: ITE is currently developing an *ITS Handbook*. However, due to the rapid evolution of ITS and technology, ITE feels that more technical publications will be needed. The audience for these publications should not only be transportation engineers but professionals from other disciplines (system integrators, software developers, etc.) who need to be aware of traffic engineering fundamentals.
- Better Use of the Internet for Cataloging ITS Information: ITE feels that the Internet can be used effectively to disseminate and locate ITS information, including education and training information, from a central website.
- Better Utilization of Academic Resources to Teach ITS: It is imperative that professionals with an education background, particularly university professors, are utilized to teach ITS-related courses ("educate educators"). ITE sees three major advantages in utilizing university professors:
  1. They possess an education background that should help in teaching ITS.
  2. They would have access to ITS knowledge and materials that they could take with them to their classrooms.
  3. They would start to modify university curricula to reflect the current trends in ITS and transportation engineering.

- The Need to Complete a Traffic Engineering Certification Program: This program would have educational and training requirements to increase the competency of traffic engineers in many areas, including ITS. The curriculum for this program would require a comprehensive education and training program to follow on the curriculum developed by Carlton Robinson.
- The Need for Interdisciplinary Education and Training: Increasing, professionals from disciplines not traditionally associated with transportation are becoming involved in ITS. These professionals may not have the transportation engineering fundamentals necessary to carry out their responsibilities. This “cross-pollination” is crucial for development and growth.
- The Need to Reach the “Crass Roots” Traffic Engineer: As ITS technologies are deployed in large urban areas, it is imperative to remember the education and training needs of transportation professionals in small communities. ITS awareness education and training should be available to all transportation professionals.
- Better Use of Existing Information Networks: There are several transportation networks that can be better utilized to disseminate ITS information. For example, the University Transportation Technology (T<sup>2</sup>) Centers can be better utilized as an ITS education and training resource.
- Better Use of Technolow for Education and Training Purposes: With declining travel budgets and shrinking transportation agencies, it is essential to use technology to bring the education and training “on site.” Use of remote classroom technologies, teleconferencing, and computerized interactive training should be taught, emphasized, and encouraged.
- More Accessible ITS Education and Training: It is important to develop more informal, short courses that can be taught by local instructors and at a reduced cost. ITS education and training should be accessible to all transportation professionals.
- Continuing ITS Awareness Courses: The need for ITS awareness courses is continuing. Existing courses should be updated periodically and presented continuously.
- Recommended Courses for Near Term (FY98 and 99): Based on its experience in this area, ITE recommended the following four courses be developed to serve the education and training needs of traffic engineers:
  - O&M of Traffic Operation Centers.
  - O&M of ITS Field Devices. This course could be based on the recommendations developed at the O&M workshop in Tampa earlier this year.
  - Introduction to Advanced Traffic Management Systems (ATMS).
  - Telecommunications for Traffic Engineers. The existing course covers the tradeoffs of various telecommunication systems. This new course would introduce participants to basic telecommunication principles, terminology and applications.

### **Plans to Maintain ITS Continuing Education and Training Programs**

Education and Training is one of ITE’s missions. ITE will continue to provide ITS educational and training programs; however, continued federal support is key to this effort-

## References

- 1, Conversations with Thomas W. Brahms, ITE Executive Director, and Mark R. Norman, ITE Deputy Executive Director, August and September, 1997.
2. Personal Knowledge, Juan M. Morales, ITE Director of Technical Programs, 1990- 1995.

# **PCB QUICK RESPONSE**

## **Task C – Modifications to the Existing Awareness Seminar**

### **Development of White Papers Concerning ITS Training and Education**

## **ITS UNIVERSITY RESEARCH CENTERS OF EXCELLENCE**

by

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Director, Center for Professional Capacity Building  
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## **ITS UNIVERSITY RESEARCH CENTERS OF EXCELLENCE**

The ITS Research Centers of Excellence (RCE) and ITS Institute Program is composed of three ITS RCE's, located at the University of Michigan, Texas A&M University, and Virginia Tech, and the ITS Institute at the University of Minnesota. Over the past four years, the RCE's and ITS Institute have, with the assistance of their FHWA funding, pursued their mission of ITS research. One of the many benefits of this research is a significant professional capacity building effort of educating future transportation professionals, the existing knowledge and labor force, as well as public and political leaders. While this approach makes effective use of resources for research and education, the ITS RCE's and ITS Institute have recognized the need to coordinate their efforts and expand the program to develop a larger cadre of professionals. The Centers believe by building upon their success to date, they can form a core consortium upon which a larger national program can be developed. Effective involvement of more universities in developing the next generation of transportation professionals will be necessary to sustain a long term ITS program. The ITS Research Centers of Excellence and ITS Institute are uniquely positioned to support and guide this effort.

The Program has made considerable contributions toward fulfilling FHWA's goals for ITS professional capacity building (PCB) and has plans to expand their efforts. As such, this paper provides a brief overview of the activities of the Program in the arena of PCB, specifically current programs underway or committed that are directly related to PCB, ITS education and training activities planned for the near future, how the demand for these activities is derived, ITS training and education initiatives that should be addressed **within the** next 5 years, and plans to maintain continuing education and training programs.

### **Current ITS Education And Training Programs**

Each university in the Program has established ITS education and training programs in one form or another which help support the vision of professional capacity building. Brief descriptions of the key accomplishments in this area at each of the member universities are discussed below. Further details can be found in Attachment A.

#### **University of Michigan RCE**

The University of Michigan RCE has established an ITS Laboratory, which has been involved with the evaluation of numerous field operational tests in the region- In this laboratory, graduate students are exposed to current systems and technologies in operation and the manner in which they can be evaluated. The University of Michigan has also established a Graduate Certificate in ITS. Over 70 students have obtained or are in the process of obtaining the Certificate by taking additional core courses focusing on ITS in their graduate program. Finally, the RCE has developed an ITS Deployment Exercise, which is a process that educates policy makers about

ITS while providing a means for planning deployment. The intent of the exercise is to lead a group of policy makers through a sequence of tasks to produce a consensus regional deployment plan while learning about public and private sector roles.

### **Texas A&M University RCE**

With respect to curricula, the Texas A&M University RCE has ensured that the undergraduate and graduate courses in transportation include ITS in their material at either the awareness, overview, specialized, or intensive knowledge level. Furthermore, the Advanced Institute in Transportation Systems Operations and Management provides graduate students with the opportunity to participate in ITS research while taking additional course work in ITS. Additionally, the RCE provides ITS research experiences for undergraduates (representing 10 universities) and minority faculty through the Undergraduate Summer Fellows and Summer Faculty programs. Finally, the TransLink™ Laboratory, an outgrowth of the RCE, is a major public/private partnership test laboratory that focuses on the synergy of linking the various parts of the ITS infrastructure into innovative applications.

### **Virginia Tech RCE**

The Virginia Tech RCE has actively pursued and attained approval of an ITS option for the Masters Degree in Civil Engineering. Thus, graduate students can specialize in ITS by taking a variety of multi-disciplinary courses related to ITS and tailor their degree to their unique interests. Furthermore, the RCE has provided funding for minority ITS education and training opportunities in cooperation with Morgan State University. Finally, the RCE funds two Virginia Department of Transportation employees each year to come to the RCE to pursue graduate degrees.

### **ITS Institute, University of Minnesota**

The ITS Institute at University of Minnesota is an integral part of the Minnesota Guidestar Program. Their ITS Laboratory is a real-time traffic data laboratory that functions in part as a next-generation multimodal transportation management center, complete with comprehensive simulation resources, computer workstations, and large screen displays. It also has the ability to provide in situ training in the application of state-of-the-art ITS technologies. Thus, students as well as transportation professionals gain hands-on experience with ITS technologies in a simulated environment.

### **ITS Education And Training Programs Planned For The Future**

The ITS RCE's and the ITS Institute realize that the Program needs to expand if it is to develop enough transportation professionals sufficient to sustain a long term ITS program. Thus, they are actively exploring how to most effectively coordinate and collaborate on topics related to education and training, research and development, and technology transfer so as to produce



benefits greater than those possible if the four institutions acted independently. Each of the four institutes in the Program has set aside \$50,000 of their year-five funds specifically for these collaborative education and training activities with the intent of contributing directly to the ITS PCB Program. This period of collaboration and evolution of the Program is known as Phase II and includes the development of a core consortium consisting of the four Program universities.

The core consortium envisions developing a specific plan of action for PCB that optimizes available resources. By establishing this plan of action, the Program, through the leadership of the ITS Institute at University of Minnesota, intends to develop a conceptual overview of potential university involvement in PCB activities, including their role in the PCB delivery framework. Furthermore, they plan to identify the best approaches for training current professionals, future leaders, and decision makers while determining where training content can be shared and the most cost effective approaches to training and education, including nontraditional media.

The four institutions will develop courses and course modules and curriculum recommendations that will be available at the end of year five (October, 1998) for future input and development of the PCB Program. The curricula will focus at the undergraduate, graduate, and continuing education levels and will examine staff, expertise, and ITS specialty areas that potentially need curriculum development. Examples of curricula planned for year five are: (1) an undergraduate ITS curriculum for use in introductory transportation courses developed by the Texas A&M RCE; (2) a master level engineering curriculum developed by the University of Michigan RCE; and (3) an introductory course in communications for Virginia Department of Transportation developed by the Virginia Tech RCE. The four institutions will also develop recommendations on modules and courses to create for non-ITS disciplines and the manner in which these courses can be delivered. Curriculum proposals will include recommendations on how non-academic training, such as internships and 5-year cooperative education programs, can be incorporated to increase: (1) the interest and number of students interested in transportation education, and (2) the interest of organizations, both public and private, in sponsoring ITS students.

Fundamentally, the four institutions are already working together as a unit. As they progress, they will develop a plan of action of how to take the core consortium idea one step further. They realize that the demand for university-based contributions in service, professional capacity building, and research, development, and deployment is far greater than the supply that can be offered by only four universities. Thus, Phase III is envisioned as having the Centers leverage their resources by providing the leadership and/or the facilitation for a national consortium of universities, perhaps with international representation and involvement with non-traditional educational institutions. The Centers realizes that coordination with other key groups, such as the University Transportation Consortium (UTC), the Council of University Transportation Centers, and the ITS America Committee on Education and Training, will be necessary for success. This national consortium will focus on contributing to the ITS service, professional capacity building, and research, development, and deployment needs of the nation. Phase III will include the involvement of both traditional educational institutions and private firms that will

jointly develop and share courseware at the education and training level and participate in collaborative R&D and community service activities.

### **Determination of Demand for Activities**

The four institutions in the Program agree that a variety of methods are necessary to determine the demand for PCB activities. These methods include but are not limited to:

- a review of existing reports on ITS training needs, including the 15 reports collected at the Volpe Center to establish a baseline;
- a survey of existing and planned university programs, including those listed on the FHWA's planned university web page to determine the current supply of programs; and
- a survey of potential ITS employers, including both public and private sector organizations currently interested in graduates from the four institutions, to determine future employment demands.

Specific plans for conducting the surveys are still in the development stage at this time. Furthermore, the four institutions will seek input from FHWA, their UTC partners, and the ITS America Education and Training Committee, of which they are members, in their curricula, course, and course module design. The purpose of this examination will be to determine which course materials might be shared as part of this PCB development process. Also, the RCE's will examine their research programs to determine whether research studies can be modified to produce case studies or course modules as outputs and how their production can be accomplished without unduly affecting the fundamental objectives of the research. The objective of this demand evaluation is to maximize the use of existing courses and course materials, to develop training modules and case studies which can be shared within and between universities at a minimum cost to the ITS RCE/Institute Program, and to eliminate duplication of effort.

### **Initiatives to be Addressed within 5 Years**

Over the next five years, the ITS RCE/Institute Program envisions a need in ITS education and training initiatives in two critical areas:

- 1) the education of the current work/knowledge force; and
- 2) the development of more relevant course instruction and curricula to educate the future work/knowledge force.

To educate the existing work/knowledge force, professional education and training should be developed in cooperation with and made available to public agencies, private sector companies, and professional organizations. With such cooperation, the specific needs of each sector of the industry can be met while exposing all to the issues associated with public/private partnerships and cooperative agreements necessary for ITS success. Such initiatives can include a professional training or certification program that is shorter than a Master's degree but which

provides in-depth knowledge regarding ITS and related topics.

To educate the future work/knowledge force, education and training initiatives can include a 5-year bachelor program which provides an emphasis in ITS and allows the graduate to enter the profession with a knowledge base that is beneficial to an employer. A cooperative education program at this level can also provide the undergraduate student with hands-on experience in the ITS arena which would not ordinarily be available. Graduate programs specializing in ITS should also be developed on a broader basis to expose the student to more in-depth knowledge on the development and application of advanced technologies to solve transportation problems.

The intent of both of these education initiatives is to develop a cadre of experienced interdisciplinary transportation researchers, educators, and practitioners that are well versed in the ITS industry. In all cases, the education and training initiatives should capitalize on the availability of alternative media formats for dissemination.

### **Plans to Maintain Programs**

Without long-term commitment, ITS education and training initiatives will become stagnant and the propensity for discontinuation is high. Thus, the ITS RCE/Institute Program plans to maintain developed programs by continuing with vigorous development of future transportation professionals through their graduate and undergraduate research programs and their programs for direct hands-on training of current ITS professionals from industry and government. Furthermore, they agree to continue to provide technology transfer and outreach activities to ensure education of the current and future work/knowledge force and public and political leaders. Their goal is a national consortium of universities with a shared research vision, innovative interdisciplinary educational programs, and coordinated service activities which promote ITS.

### **Conclusions**

Both the public and private sectors have made a major investment in ITS research, development, and deployment in recent years. The ITS Research Centers of Excellence/ITS Institute Program realizes that collaborative and coordinated investment in R&D and professional capacity building is crucial for future deployment effectiveness and the long-term sustainability of ITS. Thus, the Program in particular and the research university in general can play a critical and unique role in developing professional capacity building initiatives. Through education and training activities, the Program can ensure a system-wide education of the existing and future knowledge and labor force and public and political leadership necessary for ITS success.

**ATTACHMENT A**  
**A Vision for the Future Role of the**  
**Intelligent Transportation Systems (ITS)**  
**Research Centers of Excellence (RCE) and ITS Institute Program**

**Executive Summary**

Major investment has been made in ITS research, development and deployment due to the great promise that ITS has to positively affect the Nation's transportation system. An ITS industry is emerging. Investments have been made by the private sector in research and in the development of products and services, and return on many of these investments is starting to appear or to be close at hand. The public sector has made significant investment in the transportation information infrastructure with the hope of providing substantial benefit to its stakeholders and to stimulating essential private sector interest and investment in ITS.

Both the public and private sectors have invested in the ITS RCE/ITS Institute Program, which is composed of three ITS RCE's, located at the University of Michigan, Texas A&M, and Virginia Tech, and the ITS Institute at the University of Minnesota. The intent of this paper is:

- To indicate how the RCE's and the ITS Institute have responded to public and private investments by describing contributions in **research, education, and service** that have resulted from the Program in its first three years.
- To present a vision for the RCE/ITS Institute Program that will build on the Program's current momentum, reflect the evolving nature of ITS nationally and internationally, and take the Program to the next level, thus further enhancing the value of the Program to the Nation.

This vision assumes that current investment in R&D and professional capacity building is crucial for future deployment effectiveness and that the Program, more generally the research university, can play a critical and unique role in R&D and professional capacity building.

Our vision can be summarized as follows:

- The Program is evolving and continues to be of significant value; it has the potential to be of increased value to FHWA in the future.
- The Program should continue to evolve from a group of relatively independent organizations (Phase I) into a core consortium of universities (Phase II) and then into the leadership of a larger national consortium of universities (Phase III). We believe that these changes will significantly amplify the contributions of the Program.
- Program continuity will enhance effective Program evolution. The greatest payoff to FHWA in the near future would be by sustaining program evolution, and in so doing, build on the solid foundations that have been created by the initial Program investment, not only through individual institutional productivity but also through the synergistic effects that the Program is now beginning to capture.
- The Program can make early, vital, and effective contributions toward fulfilling FHWA's goals for ITS professional capacity building.

## **Summary Accomplishments of the Program**

Although deployment is an appropriate first emphasis to get ITS into public view and acceptance, existing capabilities are not sufficient to secure sustained, long-term success of the program. It is necessary to develop and experiment with new and innovative ideas that expand the knowledge base through cutting-edge research and that exceed current operational tests focused on deployment and limited risk. Furthermore, it is necessary to develop the technical staff to implement and maintain ITS systems. These capabilities exist in only limited amounts within the various state and local governments. It is imperative to have a successful professional capacity building effort.

The Program offers a unique opportunity to leverage innovative research and professional capacity building in order to support the development of a truly successful ITS program. The following paragraphs briefly describe what the universities in the Program have thus far accomplished in research, education, and service over the last 3 years.

### *ITS Infrastructure Development*

The ITS infrastructure is a comprehensive communication and information system for surface transportation that will be built by integrating traffic, transit, and emergency service components that are largely already in place in cities and rural communities across America. The development and integration of these components will require the development of advanced integrated and dynamic management systems (e.g. freeway, transit, and incident management systems) and the RCEs and the ITS Institute have been leading the way in their development. Examples of progress by the RCEs and the ITS Institute in the development of these systems follow:

- The Texas A&M RCE has developed a real-time multimodal traffic adaptive diamond interchange control system as well as a prototype, open-architecture information and communications systems in police vehicles targeted at enhancing incident response and commercial vehicle enforcement capabilities.
- The University of Minnesota ITS Institute has developed KRONOS, an efficient personal computer-based freeway traffic analysis tool that can simulate traffic responsive ramp metering strategies and HOV lanes.
- The Virginia Tech RCE has developed wide area incident management software (WAIMS) that will be deployed and tested in both the Northern and Suffolk Areas of Virginia in cooperation with VDOT. The RCE has also funded both the development of wireless technologies for use in Automatic Vehicle Location and Automated Highway Systems and the development of fiber optic and acoustical sensors for traffic surveillance, structure/pavement monitoring, and vehicle control.
- The University of Michigan RCE, MDOT, and the Road Commission for Oakland County, have developed MOTORCITI, a public-private partnership to facilitate the integration and extension of the current ITS infrastructure in Southeast Michigan.

### *Institutional Issues*

As ITS technologies have continued to develop at a rapid pace, issues of an institutional nature have begun to come to the forefront. As questions concerning the effective deployment (in terms of administrative, social, and economic systems) of new ITS technologies have continued to arise, the RCEs and the ITS Institute have helped find the answers. Examples of developments by the RCE/ITS Institute to date include:

- The University of Michigan RCE has conducted an ITS Industry Study focused on advanced cruise control, dynamic route guidance, and automatic vehicle location and two-way communication systems for commercial vehicle operations. The third technology bundle is part of a larger study of impact of information technology on the trucking industry. This activity leverages support from the RCE and the Sloan Foundation and will incorporate and contribute to work to be accomplished through the ITS America Institutional Issues Committee on CVISN.
- The Texas A&M RCE has developed an ITS plan for the Texas-Mexico border developed with input from an Advisory Panel representing all major stakeholder groups.
- The University of Minnesota ITS Institute is an integral part of the state of the Minnesota Guidestar Program. Guidestar's vision is to bring the benefits from application of ITS. ITS will be fully integrated into transportation strategies for the enhancement of safety, mobility, and economic vitality, for the protection of the natural environment, and for the development of sustainable communities.

### *ITS Development and Evaluation Infrastructure*

Leveraging RCE/ITS Institute funding, these university research organizations have actively pursued the development of state-of-the-art ITS laboratories. These facilities, with capabilities such as comprehensive, full-scale ITS simulation, as well as real-time ITS technologies testing, evaluation and validation, are well on their way to becoming the leading ITS technology testing facilities in the world. Examples of these developing facilities include the following:

- The University of Minnesota ITS Institute has developed the ITS LABORATORY, a real-time traffic data laboratory that functions in part as a next-generation multimodal transportation management center, complete with comprehensive simulation resources, computer workstations, and large screen displays, and that provides hands-on training in the application of state-of-the-art ITS technologies.
- The Virginia Tech RCE has contributed to and is actively pursuing the development of the SMART HIGHWAY, a full-scale roadway with built-in ITS infrastructure for development, testing and evaluation of sensors and communication systems, crash avoidance technology, automated vehicle control systems and other in-vehicle systems. This facility will be operational in 1998.
- The University of Michigan ITS Laboratory has been involved with the evaluation of numerous field operational tests. These FOTs include FAST-TRAC, DIRECT, and the SMART Community Transit.

- The Texas A&M University TransLink™ Laboratory has been developed from the RCE program as a major public/private partnership focusing on the synergy of linking the various parts of the ITS infrastructure into innovative applications.

### *Professional Capacity Building*

As ITS has progressed as a field of study and as ITS technologies have begun to move beyond the research and development stages, it has become apparent that the effective deployment of these goods and products, in both the public and private sectors, will depend on a well educated knowledge and labor force as well as a knowledgeable public and political leadership. Professional capacity building serves to ensure such a system-wide education. Examples of RCE accomplishments in this area include the following:

- The University of Michigan RCE has developed an ITS Deployment Exercise, a process that educates policy makers while providing a means for planning ITS deployment by leading a group through a sequence of tasks to produce a consensus regional deployment plan and learn about public and private sector roles. The University of Michigan also has an Graduate Certificate in ITS, with over 70 students who have obtained or are in the process of obtaining the Certificate.
- The Texas A&M RCE has involved more than 90 undergraduate and graduate students, and 12 faculty members from three System universities (Prairie View A&M, Texas A&M, and Texas A&M International) as well as Louisiana State University in research activities. In addition, the RCE provided summer research experiences for 13 undergraduate fellows (representing 10 universities) and three minority faculty fellows.
- The Virginia Tech RCE has actively pursued and has attained approval of an ITS option for the Masters Degree in Civil Engineering, has provided funding for minority ITS education and training opportunities in cooperation with Morgan State University, and funds two VDOT employees per year to come to the RCE to pursue graduate degrees.

### **The Role of the American Research University in Transportation Research and Professional Capacity Building**

The Nation's capacity to innovate will play a dominant, and probably decisive, role in enhancing the U.S. standard of living. A sustained program of research and professional capacity building serves to insure the existence of a suitably sized and properly educated knowledge and labor force.

At the national level, contributors to research and professional capacity building include universities, other public agencies, and private firms. The collaboration of these providers may promote significant synergies. The groups that are potential customers for a program in transportation research and professional capacity building are current and future:

- Transportation professionals in the public sector - Federal, State, and local transportation agency staff.

- Transportation professionals in the private sector - commercial vehicle logistics providers.
- Transportation educators and researchers.
- Public and elected officials.

The levels of expertise that are required by these groups clearly vary but include the following:

- General awareness and overview knowledge of transportation program elements, costs, and benefits. Potential audiences include senior transportation officials and policy makers and the general public (including K- 12).
- Basic knowledge of specific transportation program elements. Potential audiences include USDOT, state and local government personnel in entry or low-level positions involved in ITS program development and delivery.
- Intermediate in-depth knowledge of specific transportation program elements. Potential audiences include USDOT, state and local government personnel in mid-level positions involved in ITS program development and delivery, and ITS professionals.
- Advanced in-depth knowledge of specific transportation elements and emerging state-of-the-art technology. Potential audiences include USDOT, state and local government personnel in high-level positions involved in ITS program development and delivery, and ITS professionals, particularly the R&D knowledge force (e.g., researchers and educators).

Educating the current work/knowledge force might be accomplished in large part by the private sector. However there is a significant role of the American research university to help ‘train the trainers’ as a continuing education function.

In educating the future work/knowledge force, we contend that it is vital that transportation-related cutting-edge R&D and graduate education be inextricably linked within the university, a link that leads to a faculty more directly aware of current developments, more relevant course instruction and curricula, and hence students who are more capable of significant contribution immediately upon graduation. This direct educator-researcher linkage is an efficient technology and knowledge transfer mechanism that has been in large part the reason for the success of the American research university.

## **The Future Role of the Universities in the Program**

All universities in the Program have a common mission - research, education, and service. All have impressive transportation-related research and educational capabilities and assets. We conceptualize the Program as having three developmental phases. For the future, we propose to let the high level of accomplishment in the past (Phase I) serve as a launching point for further contributions through the development of more synergistic relationships between the existing centers (Phase II) and by leveraging center resources through relationships with other universities (Phase III).

U.S. universities need to develop a cadre of experienced interdisciplinary transportation researchers, educators, and practitioners, and this requires a shift toward a more collaborative,



integrated, and synergistic focus shared between all of the universities in the Program. Such a shift could be further facilitated by the Program universities serving as the core of a national consortium of universities, perhaps with international representation and involvement with non-traditional educational institutions. Such a consortium could be vital in research and graduate education within and across all university transportation research programs.

Phase I. During much of the first three years of the Program, each of the organizations has focused on locally important developmental issues: developing a cadre of experienced interdisciplinary researchers and developing relationships with external sponsors. This pattern of 'start-up' activity appears to be consistent with the initial activities of other interdisciplinary, university-based centers with a mission-oriented focus. We refer to this start up period of the Program as Phase I.

Phase II. Now that each of the centers has developed an experienced and mission-oriented R&D knowledge force and a track record of interacting with the non-academic ITS community, the centers can now shift toward a more integrated and synergistic focus. The Program is reaching a critical stage where each of the four centers is beginning to reach out to the others with the intent of establishing a variety of collaborative relationships. This synergy, with continuity and in combination with growing institutional momentum and maturity, promises to amplify the relevance and excellence of the contributions of the organizations to the ITS stakeholder community. We refer to this newly emerging period of the Program as Phase II, the development of the core consortium.

Phase III. However, the demand for university-based contributions in service, professional capacity building, and research, development, and deployment is far greater than the supply that can be offered by only four universities. Phase III of the Program is envisioned as having the centers leverage their resources by providing the leadership and/or the facilitation for a consortium of universities, the national consortium, perhaps with international representation and involvement with non-traditional educational institutions. This consortium would be focused on contributing to the service, professional capacity building, and research, development, and deployment needs of the Nation. Models for this future phase include consortia, some involving both traditional educational institutions and private firms, that jointly develop and share courseware at the education and training level and participate in collaborative R&D and community service activities.

### **Plan of Action - Taking the ITS RCE Program to the Next Level**

The first action to take is for the four universities to participate in a process of consensus building and information interchange over the next three months that would have the following objective:

- To determine the most effective form of collaborative relationship between the universities in the Program in order to insure successful Phases II and III.

Each of the four universities has agreed to participate in this process and to include this activity in its fifth year strategic plan. The development of a plan, in cooperation with the ITS

Professional Capacity Building Program and detailing how the RCEs and the ITS Institute can best contribute to professional capacity building, is a current and high initial priority. A specific action in this regard is the organization of an informal workshop on 28 February 1997 in Washington to be attended by Tom Humphrey, the four Directors, and other academic opinion leaders in transportation education and professional capacity building. The purpose of this workshop is discuss how the American research university can best contribute to the Nation's need for professional capacity building.

Some other possible action items that could result from this joint activity:

- Research. The development of a shared research vision, in the context of national needs and in partnership with USDOT, leading to coordinated research plans, and perhaps joint research projects with the goal of capturing the full potential of ITS. This vision would consider the eventual inclusion of other universities (and the UTCs), leveraging the public-private investment in the Program. Joint research dissemination efforts, e.g., a centers-organized special issue(s) of the ITS Journal, jointly organized conference sessions, workshops, etc.
- Education. The development of innovative interdisciplinary educational programs, tightly linked with the research activity, that emphasize the involvement of faculty and research staff who serve as both researchers and educators and students who are also involved in research activities. The development of a plan to most effectively lead and/or facilitate the development of university consortia (and/or an association) that develop and share innovative educational and degree programs. The universities in the Program - the American research universities that have been designated for their excellence in ITS - can play a central role in the aforementioned activities. The development of the universities in the Program as a technical resource to the UTCs for the purpose of professional capacity building. The UTCs, in which the Program universities also participate, could be the mechanism for delivering education and training programs to the future ITS work and knowledge force throughout the U.S.
- Coordinated service activities, including outreach (e.g., the sponsoring of a co-service. sponsored symposium on professional capacity building that would in part address the role of the research university in professional capacity building and the role of the universities in the Program in professional capacity building. Coordinated continuing education activities, e.g., a joint continuing education summer course(s), student and faculty summer research fellowship programs, executive scanning tours, distance-learning seminars, and participation as a stop on FHWA's Highway Engineers Training Program.